

- 1) The tissue giving rise to the lining of the pericardial space is:
  - a. mesothelium
  - b. Ectoderm
  - c. Mesoderm
  - d. Endoderm
- 2) Which of the following is NOT true regarding epithelium?
  - a. Glycocalyx is found on the apical (free) surface
  - b. Dynein ATPase provides energy to bend cilium
  - c. Stratified = more than one layer
  - d. Distended transitional epithelium surface cells are 5-10 layers thick
- 3) Which tissue type best describes skin? BE SPECIFIC.
  - a. Stratified squamous epithelium
  - b. Keratinized cuboidal epithelium
  - c. Keratinized stratified squamous epithelium
  - d. Non-keratinized stratified cuboidal epithelium
- 4) Which of the following is NOT true regarding hemidesmosomes?
  - a. Attachment plaque is on cytoplasmic side
  - b. Actin filaments embedded into plaque
  - c. Transmembrane protein is integrin
  - d. Appears as one half of a desmosome
- 5) Demilunes are a combination of:
  - a. Mucus & serous
  - b. Ceruminous & serous
  - c. Mucous only
  - d. None of the above
- 6) Mammary gland secretion works through which mechanism?
  - a. Merocrine
  - b. Apocrine
  - c. Holocrine
  - d. Cytocrine
- 7) Beta-mercaptoethanol is best described as doing what to a protein?
  - a. Breaks up beta-sheets
  - b. Renatures protein to original configuration
  - c. Disrupts non-covalent bonds
  - d. Reduces a type of covalent bond
- 8) All of the following are true regarding proteins except:
  - a. Cooperative transition is described as an "all or nothing" process
  - b. Vitamin C (ascorbate) is essential for hydroxylation of proline
  - c. Once dissolved in 8 M urea and beta-mercaptoethanol, the protein is permanently altered
  - d. All of the above is true
- 9) Separation of molecules based off of pH is done utilizing:



- a. Column chromatography
- b. Affinity chromatography
- c. Ion exchange chromatography
- d. SDS-PAGE

10) Isoelectric focusing works via

- a. Proteins separated based off of pI when exposed to pH gradient
- b. Proteins moving through a column at speeds based on the protein's net charge
- c. Electric current that separates proteins based off of mass
- d. The smallest proteins travelling the fastest through a vacuum

11) When determining amino acid sequence via edman degradation

- a. Proteins are first hydrolyzed in 6 N KOH
- b. The amino terminal is labeled with phenyl isothiocyanate
- c. Each amino acid reacts with ninhydrin, then absorbance is measured
- d. No information may be ascertained regarding protein function

12) With regards to protein folding

- a. Protein folding is generally a slow process
- b. Folding into a tertiary structure is generally random
- c. Ab initio predictions work from computers projecting conformation compatibility
- d. A release of free energy helps guide the enzyme into its correct shape

13) Osmotic pressure...

- a. Makes a cell swell in a hypertonic solution
- b. Makes water flow in the direction of lower solute concentration
- c. Makes a cell shrink in hypotonic solution
- d. Is the hydrostatic pressure required to prevent net flow

14) For muscles and fat cells, which transporter is responsible for the uptake of glucose?

- a. GLUT1
- b. GLUT2
- c. GLUT3
- d. GLUT4

15) Which is incorrect about the glucose uptake transporter?

- a. Pancreatic beta cells secrete insulin when glucose levels are high
- b. Insulin binds GLUT then passes through membrane
- c. GLUT moves to the surface in muscle cells due to signal transduction
- d. Glucose transporters are stored in vesicles

16) A voltage gated channel

- a. Requires the binding of two acetylcholine molecules to open
- b. Always is composed of a single polypeptide
- c. Requires the "shedding" of a water shell
- d. Requires ATP

17) All of the following are true regarding channelopathies except:



- a. Myasthenia gravis is an acquired autoimmune disease
  - b. Antibodies made against the acetylcholine neurotransmitter cause MG
  - c. In Cystic Fibrosis, the channel is made but not transported to the membrane
  - d. ABC-type transporters require TWO ATP's per cycle
- 18) Which of the following is an example of secondary transport?
- a. Na, glucose symporter
  - b. Na, K ATPase
  - c. H,K ATPase
  - d. CO<sub>2</sub> diffusing through a membrane
- 19) Retinoblastoma may be caused by
- a. Cyclin D arrest
  - b. Low levels of MDM2
  - c. Defects in Rb gene
  - d. Increase in p53
- 20) Which is not a possible response for damage to DNA from sun exposure?
- a. P53 is phosphorylated, released from MDM2
  - b. P21 blocks cyclin-CDK
  - c. Apoptosis
  - d. P16 binds Cyclin E/CDK2.
- 21) A CDK inhibitor is best defined as:
- a. Preventing the phosphorylation of Rb
  - b. Activates CDK-cyclin complex
  - c. Three families of proteins, INK4, INK6 and KIP
  - d. Binding E2F to prevent transcription
- 22) Which cyclin-CDK complex is mismatched?
- a. Cyclin B/CDK1
  - b. Cyclin E-CDK4/6
  - c. Cyclin A-CDK2
  - d. All are correct
- 23) Where is DNA replicated?
- a. Metaphase
  - b. G<sub>1</sub>
  - c. G<sub>2</sub>
  - d. S
- 24) In which phase of mitosis do kinetochore microtubules become shorter?
- a. Prophase
  - b. Telophase
  - c. Metaphase
  - d. Anaphase
- 25) As concentration of the ligand increases [L] with respect to K<sub>d</sub> on a saturation curve,



- a.  $K_d$  doesn't really factor into the equation (ie, its value will not impact the calculation)
- b.  $L$  doesn't really factor into the equation (ie, its value will not impact the calculation)
- c.  $L$  approaches  $K_d$
- d.  $L$  is linear with respect to  $K_d$

26) Which is not true regarding hemoglobin?

- a. It is composed of a tetramer
- b. Contact between the alpha and beta subunit is ionic
- c. It allows for a higher concentration of oxygen to be carried into the blood
- d. Binds 4 oxygen molecules, while Mb binds one

27) Deleted

- a. deleted
- b. deleted
- c. deleted
- d. deleted

28) A key difference between the Koshland and Monod model of Hb is

- a. In the Koshland model, not all subunits may simultaneously be in the same state
- b. The Koshland model requires symmetry, whereas Monod model does not
- c. The Monod model allows for sequential change in conformation
- d. Koshland, more than Monod, may explain both positive and negative cooperativity

29) Which COULD be a homotropic effector for hemoglobin?

- a.  $H^+$
- b.  $O_2$
- c. 2,3 BPG
- d.  $CO_2$

30) Regarding the induction of a structural change in Hb

- a. Oxygen binding to heme displaces heme out of its planar shape
- b. Upon binding of  $O_2$  in a subunit, the ionic interactions that subunit contributes to are stabilized
- c. A salt bridge may be formed when certain residues are protonated, reducing affinity for  $O_2$
- d. A salt bridge forms between an aspartyl and lysyl residue

31) Which does not describe hypercellular obesity?

- a. Overfeeding as an infant
- b. Increased number of fat cells
- c. More common than hypertrophic
- d. more serious than hypertrophic

32) Wandering cells

- a. Is a larger classification for mast cells and plasma cells
- b. Form cell lined-fiber network
- c. Are a type of chondrocyte
- d. Are agranular

33) Which of the following is false regarding collagen?

- a. Type III collagen is best for delicate support



- b. Hydrogen bonding between hydroxyproline molecules stabilizes adjacent polypeptides
- c. The basal lamina may contain Type IV collagen
- d. A fibril is smaller than a fiber

34) A difference between elastic and reticular fibers might be

- a. Reticular fibers branch in a "Y" shaped pattern
- b. Elastic fibers, or more specifically their failure, may result in Ehler-Danlos type IV
- c. A defect in reticular fibers may be responsible for Marfan's Syndrome
- d. Elastic fibers may be found in places such as the aorta and uterus

35) Proteoglycans...

- a. May take the form of Aggrecan, which is made of hundreds of Hyaluronic acid residues
- b. Form dense, irregular tissue
- c. Have glycosaminoglycans attached to a protein core, making it slippery
- d. May never be transmembrane

36) Which of the following is true regarding connective tissue?

- a. Oncotic pressure drives in the arteries drives fluid away from the ECM
- b. Fibronectin binds to Collagen IV and syndecan
- c. Myxedema is due to underproduction of GAG's during hypothyroidism
- d. The basement membrane may act as a macromolecular sieve/filter

37) Which protein is typically NOT associated with cell-cell adhesion?

- a. Cadherin
- b. Selectin
- c. Ig-like CAMs
- d. Syndecan and fibroglycan

38) Which step in extravasation is mismatched?

- a. Migration—leukocytes secrete metalloproteases to break junctional complex
- b. Adhesion—P-selectin temporarily binds to selectin receptor
- c. Activation—endothelium produces platelet activating factor
- d. Trapping—bond between wandering cell and endothelium is still weak

39) Which of the following is false regarding cell motility?

- a. Leukocytes and macrophages undergo slow diapedesis
- b. Integrin consists of alpha and beta heterodimers and is transmembrane
- c. The basal lamina is essential for differentiation and formation of the salivary gland
- d. Chemotaxis is one way the cell can recognize which way to go

40) Which is not a possible mechanism for the cell membrane to move forward?

- a. Growing microfilaments polymerize via profilin influence to push the membrane
- b. Myosin I attaches to membrane and cytoskeleton, then myosin moves forward
- c. Microfilaments attach to polymerizing intermediate filaments, push membrane
- d. Myosin I attaches to membrane, push membrane forward, but without profiling

41) How does the orientation of cells being deposited in tissue relate to cell motility?

- a. Transmembrane Cadherin proteins assist in aligning adjacent plasma membranes



- b. Integrins mediate interaction between ECM and cytoskeleton, this brings order to ECM and organizes the matrix and surrounding cells
- c. The basal lamina is first deposited via diapedesis
- d. Stress fibers between cells are the last thing to form in newly deposited tissue

42) Which is true regarding the process of organ formation?

- a. Laminin is not involved in neurite outgrowth
- b. Fibronectin must interact with the basal lamina to form mature glands
- c. Mesenchyme develops later in adult life
- d. A myoneural junction's synaptic region will eventually contain both laminin and Collagen IV

43) Which genotype generally has a worse outcome for a patient?

- a. HbA and HbS
- b. HbS and HbS
- c. HbC and HbC
- d. HbC and HbS

44) How does "sickling" work?

- a. Lys replaces Glu, the resulting negative charge aggregates alpha subunits
- b. Blood cells of HbS, or sickle cell phenotype, gather together to form a peculiar shape
- c. Oxygenated HbS reveals a spot for other Hb's to bind to
- d. Enough HbS aggregates due to the Glu->Val mutation and if the beta subunits stay aggregated long enough, the cell membrane will permanently alter

45) Which is not true regarding enzymes?

- a. Offer an alternate reaction pathway
- b. Increase kinetics of a reaction
- c. Decrease delta G of a reaction
- d. Not undergo microscopic reversibility

46) Regarding enzyme kinetics,

- a. The enzyme forms a complex with the substrate
- b. An increase in delta H makes the reaction more favorable
- c. The enzyme has higher affinity for substrate than it does transition state
- d. Nucleophilic groups on an enzyme attack electron dense regions

47) Which would increase a force between two charges?

- a. Decrease the mass of one of the charged particles
- b. Decrease the distance
- c. Increase the dielectric constant
- d. Decrease the charge

48) Which is incorrect regarding proteases?

- a. Chymotrypsin, trypsin, and elastase are all serine proteases
- b. Elastase is specific for positively charged residues
- c. HIV protease works through a "flap" like mechanism
- d. Aspartic proteases start by abstracting a proton from water



1. C  
2. D  
3. C  
4. B  
5. A  
6. B  
7. D  
8. C  
9. C  
10. A  
11. B  
12. D  
13. D  
14. D  
15. B  
16. C  
17. B  
18. A  
19. C  
20. D  
21. A  
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35. C  
36. D  
37. D  
38. B  
39. A  
40. C  
41. B  
42. D

43. B  
44. D  
45. C  
46. A  
47. B  
48. B